SOIL TESTS IN URBAN PARKS: *ASSESSING THE IMPACTS OF DOG USE FINAL REPORT*

Submitted by:
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with
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With the help of the LACF, we have scratched the surface of our understanding of dog impacts on park soils through novel DNA testing.

What's In Here?

This research project has been made possible with research grant funding provided by the Landscape Architecture Canada Foundation.

Proponent Team

Tyler Allen Bradt | Project Lead

Principal Landscape Architect at Fieldwork Design Office Ltd.

BES, DIPLA, MLA, OALA, CSLA

With over 15 years of experience in Landscape Architecture, Urban Design, and Horticulture, Tyler brings a comprehensive approach to creating dynamic outdoor spaces rooted in culture and place. From urban parks and plazas to streetscapes, courtyards, and green roofs, Tyler has led projects from concept to construction. Throughout his career, Tyler has developed a deep understanding of the intersection between the anthropomorphic landscape, and ecology, ensuring that each project enhances the built environment while fostering a connection to nature and promoting biodiversity and ecosystem resilience.

Katie Strang |

Senior Landscape Architect at Fieldwork Design Office Ltd.

BES, DIPLA, MLA, OALA, CSLA

Katie is a landscape architect, project manager, and arborist with over a decade of experience practicing through the lens of urban ecology. Her work includes campus landscapes, parks, play spaces, streetscapes, planting design, arboriculture, and contract administration in both public and private sectors. Her practice emphasizes detail, aesthetics, and ecological processes, and is built on a foundation of hands-on expertise in horticulture and landscape construction, as well as work on numerous residential projects in the GTA and Dufferin County. Katie also pursues art projects through her collaborative venture D&S Projects, and has been exhibited at venues such as Jardins de Métis, Scotiabank Nuit Blanche, and the Gardiner Museum.

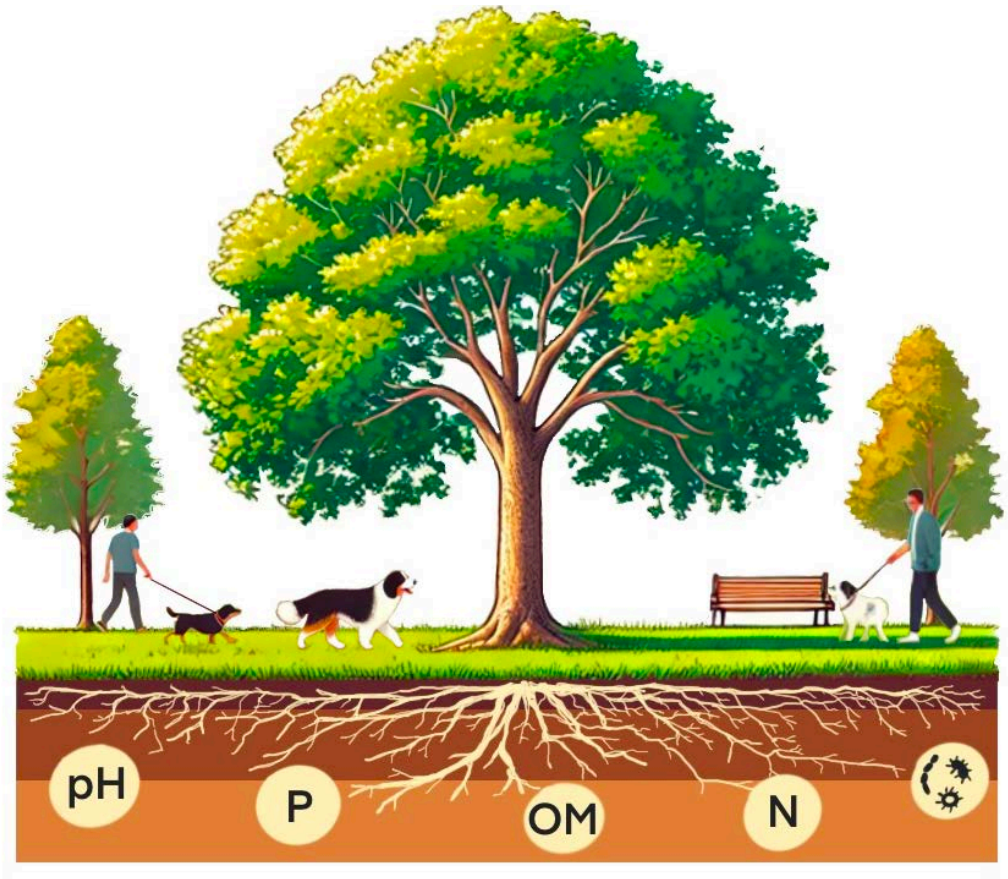
Michael Ormston-Holloway

BSc, MScP, MLA, OALA, CSLA, ASLA, ISA

With over two decades of professional practice in landscape architecture, and a career before that in the biological and ecological sciences, Michael has a wealth of knowledge and experience with which he brings to his projects, and many technical perspectives with which to consider planning, design, and implementation toward more successful projects, and project outcomes. Michael currently defines his practice at the intersection of science and design, focusing strongly on landscape performance toward better tree and ecological strategies. Through this work, he has helped municipal, institutional, and private sector clients develop robust landscape design strategies centred on placemaking and public realm activation, environmental protection and enhancement, and the interpretation of natural processes and cultural patterns through thoughtful aesthetic and functional expression.

Initial Research Question

As cities become denser, park usage naturally increases, and it becomes more important for landscape architects to understand the carrying capacity of urban soils to support trees in parks and streetscapes. This project seeks to develop a standard test to quantify dogs' impact on these elements through a combination of lab-based soil testing and field observations. Building on existing soil tests that measure nitrogen and phosphorus—key outputs from dogs—it will also assess bacterial presence and identify other toxins toward an examination of how dog activity patterns create concentrated areas of damage in parks.



Results of Study

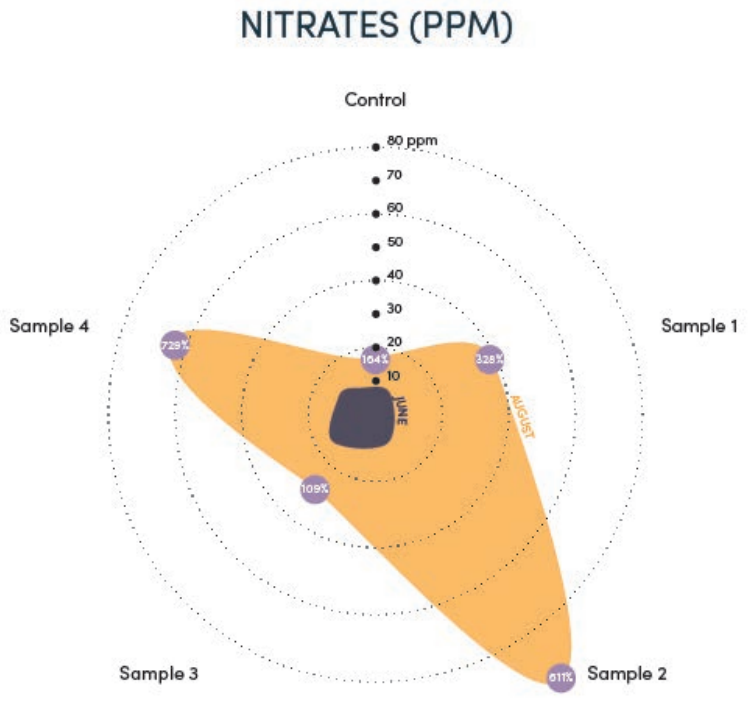
With support from the Landscape Architecture Canada Foundation, we investigated how intensive dog activity influences urban park soils at Allan Gardens, Toronto. Originally focused on standard chemical testing, we expanded the scope to include microbial DNA sequencing—providing a more complete picture of soil processes under nitrogen stress and evaluating new technology for use by landscape architects.

Methods

- **Chemical Analysis:** Conducted by **SGS Guelph**, using standard soil tests for **nitrate nitrogen (NO_3-N), ammonium (NH_4^+), total salts (EC), pH**, and **total Kjeldahl nitrogen**.
- **Microbial Analysis:** Performed by **Metagenom Bio Life Sciences**, using amplicon sequencing to assess bacterial diversity and nitrogen-cycling functional groups.

Key Results

- **Nitrate Hotspots:** Dog-impacted zones showed dramatic nitrate increases over the season. One site near the dog park entrance rose by **610%**, compared to **62%** in the control. Chronic nitrogen loading creates localized chemical imbalances that can affect root health and turf resilience.
- **Rapid Ammonium Conversion:** Ammonium remained low and stable, indicating fast microbial nitrification under summer conditions.
- **Salinity Stress:** Total salts increased slightly in high-use areas compared to the control area which stayed the same. This is likely the result of urea breaking down into soluble ions in the soil which forms salts. This adds stress for fine roots, particularly in compacted soils.
- **Stable pH:** Despite heavy nitrogen inputs, pH remained stable due to strong buffering from local geology and urban fill—highlighting the need for indicators beyond pH.
- **Microbial Shifts:** Sequencing revealed subtle declines in bacterial diversity and increased abundance of nitrogen-processing specialists in dog zones. These changes suggest emerging niche heterogeneity and possible long-term effects on soil resilience.



Impact of Funding

Funding enabled us to move beyond conventional chemical tests and integrate microbial analysis—a first for urban park soil studies in Canada. This dual approach revealed not only chemical imbalances but also biological adaptations, offering actionable insights for park management and design.

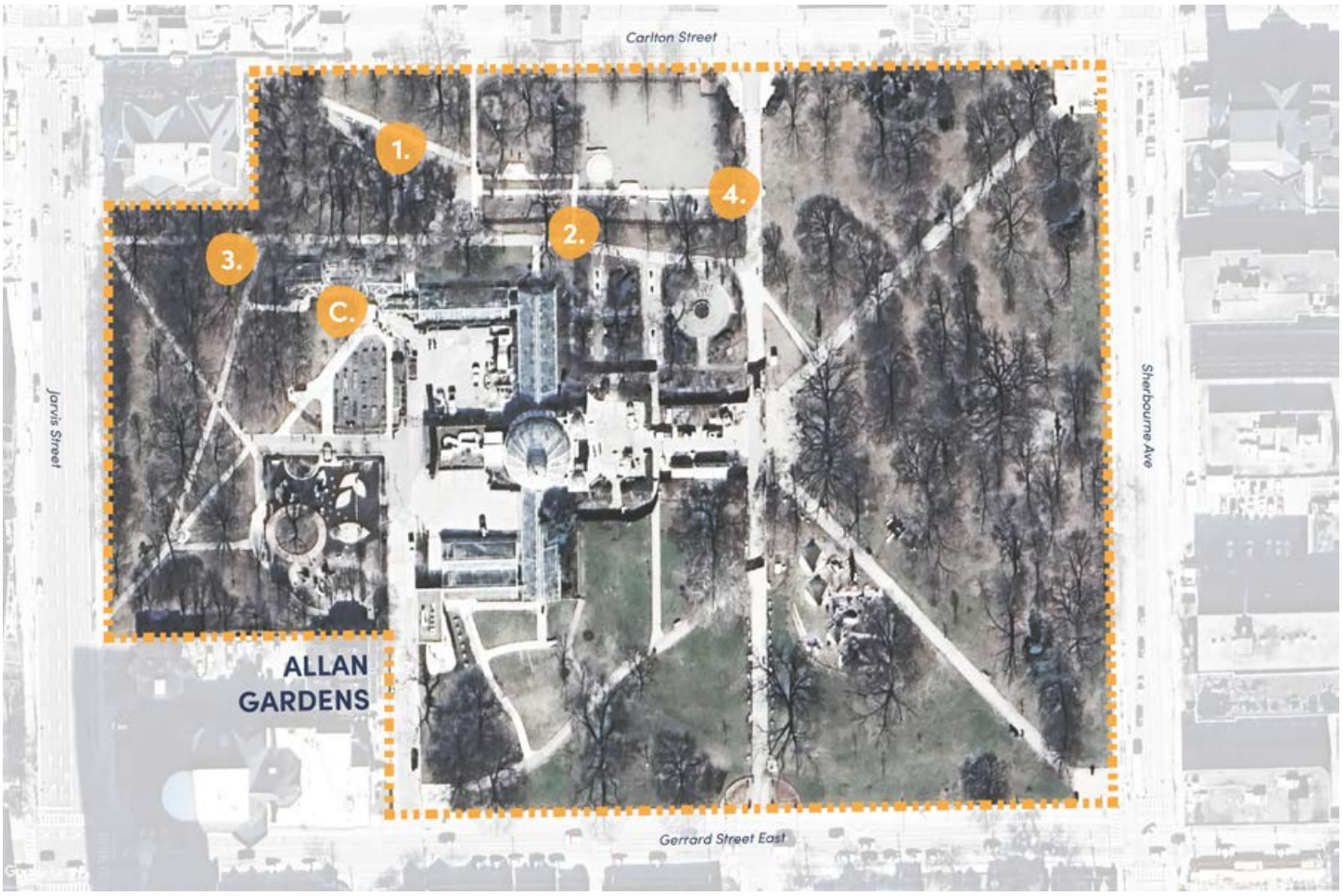
Implications for Practice

- **Targeted Testing:** Include nitrate and microbial indicators in soil assessments for high-use dog zones.
- **Context Matters:** In alkaline soils, changes in nitrogen, salts and compaction are more reliable indicators than pH.
- **Design Strategies:** Protective root zones, mulched buffers, and circulation planning can mitigate compaction and nitrogen hotspots. Further review of strategies from sports firld management could be applicable to parks with heavy dog use such as compaction-resistant sand-based soils, drainage layers, aeration, top dressing, and field recovery schedules.

Conclusion

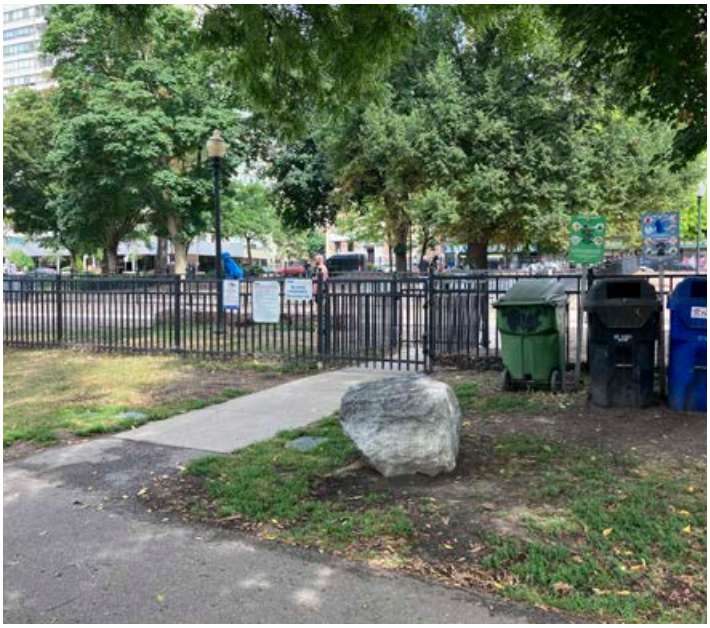
Dog activity interacts with soil chemistry, biology, and structure in ways that matter for long-term park health. By combining chemical and microbial testing, this study demonstrates the value of integrated soil analysis for resilient, multifunctional urban landscapes. Deeper insight and analysis will be forthcoming in future landscape publications and/or or presentations/webinars.

with special thanks to* **Jack Legg *at* **SGS Canada** *and* **Michael Lynch** *at* **Metagenom Bio** *for their expertise and support and to* **Matt Canaran** *at* **Friends of Allan Gardens** *and* **Heidi Weidelich** *at* **The City of Toronto** *for their cooperation.*



Study Area Testing Locations

Test Site 1



Test Site 2

Test Site 3

Test Site 4

Control Site

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